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TITLE: Rooftop package unit diagnostician

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INVENTOR-INFORMATION:

NAME	CITY	
STATE COUNTRY RULE-47		
Chassin, David P.	Pasco	WA
US		
Pratt, Robert G.	Kennewick	WA
US		
Reid, Larry Dean	Benton City	WA
US		

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CLAIMS:

What is claimed is:

1. A method, comprising: calibrating a remote sensor interface by determining one or more calibration delay times for the remote sensor interface with a processor; sending a first signal from the processor to the remote sensor interface; receiving a second signal at the processor from the remote sensor interface in response to said sending; timing a delay between said sending and said receiving with the processor; and determining an output level of a sensor operatively coupled to the remote sensor interface as a function of the delay and the calibration delay times.
2. The method of claim 1, further comprising providing the remote sensor interface, wherein the remote sensor interface includes a

voltage-controlled
oscillator operatively coupled to the sensor and a counter
operatively coupled
to the voltage controlled oscillator.

3. The method of claim 2, further comprising: generating
pulses with the
voltage controlled oscillator at a frequency proportional to
the output level
of the sensor; counting a specified number of pulses from
the voltage
controlled oscillator with the counter; and sending the
second signal to the
processor in response to said counting.

4. The method of claim 1, further comprising providing the
processor, wherein
said processor includes an internal clock.

5. The method of claim 1, wherein said calibrating includes:
sending a
calibration signal from the processor to the remote sensor
interface;
receiving a calibration response signal from the remote
sensor interface in
response to said sending the calibration signal; and timing
one of the
calibration delay times between said sending the calibration
value and said
receiving the calibration response signal, wherein the one
calibration delay
time is proportional a specified calibration reading at the
sensor interface.

6. The method of claim 1, wherein the calibration delay
times include a high
calibration delay time.

7. The method of claim 1, wherein: said calibration delay
times include a low
calibration delay time that corresponds to a low calibration
sensor reading
from the remote sensor interface and a high calibration delay
time that
corresponds to a high calibration sensor reading from the
remote sensor
interface; and said determining the output level includes
normalizing the

delay to a normalized value between a lower limit that corresponds to the low calibration delay time and an upper limit that corresponds to the high calibration delay time.

8. The method of claim 7, wherein the lower limit is zero and the upper limit is one.

9. The method of claim 1, further comprising displaying an equipment diagnosis based at least in part on the output level of the sensor.

10. The method of claim 1, further comprising: retrofitting the sensor to a heating, ventilation and air conditioning unit; wherein the output level of the sensor corresponds to a temperature reading from the unit; and diagnosing with the processor an error in the unit based on the output level of the sensor.

11. The method of claim 1, wherein the first signal is a strobe signal and the second signal is an interrupt signal.

12. A system, comprising: a sensor device operable to sense a reading from a machine; a processor operatively coupled to said sensor device; said processor being operable to send a first signal to said sensor device and to receive a second signal from said sensor device; said sensor device being operable to delay sending said second signal in proportion to said reading; said processor including an internal clock operable to time a time delay between sending the first signal and receiving the second signal; and said processor being operable to determine the reading from said sensor device based on said time delay.

13. The system of claim 12, wherein said sensor device includes: a sensor

operable to generate an output voltage proportional to said reading; a voltage-controlled oscillator operatively coupled to said sensor, said voltage-controlled oscillator being operable to generate a signal at a frequency proportional to said output voltage of said sensor; and a counter operatively coupled to said voltage-controlled oscillator and said processor, said counter being operable to delay sending said second signal in response to said first signal by a time period proportional to said frequency of said signal from said voltage-controlled oscillator.

14. The system of claim 13, wherein: said signal generated by said voltage-controlled oscillator includes pulses; and said counter is operable to send said second signal in response to counting a specified number of pulses from said voltage-controlled oscillator.

15. The system of claim 13, wherein said sensor includes a thermistor.

16. The system of claim 12, further comprising said machine, wherein said machine includes a heating, ventilation and air conditioning unit.

17. The system of claim 12, wherein said processor is operable to diagnose errors in said machine based in part on said reading.

18. The system of claim 12, wherein said processor is operable to periodically calibrate said sensor device.

19. A system, comprising: a heating, ventilation and air conditioning unit, said unit including a controller for controlling operation of said unit; a diagnostic device operatively coupled to said unit, said diagnostic device being operable to monitor status of said unit, said diagnostic device including

a processor operatively coupled to said controller, a clock operatively coupled to said processor, one or more remote sensors attached to said unit, wherein said remote sensors are operable to generate output voltages proportional to readings from said unit, one or more multiplexers operatively coupled to said sensors and said processor to select one of said sensors to read, a voltage-controlled oscillator operatively coupled to said multiplexers, said voltage-controlled oscillator being operable to generate pulses at frequencies proportional to said output voltages from said sensors, a counter operatively coupled to said voltage-controlled oscillator and said processor, said processor being operable to send one or more first signals to said counter, said counter being operable to send one or more second signals to said processor in response to said first signals after counting a predefined number of pulses from said voltage-controlled oscillator, said timer being operable to time delay times between sending said first signals and receiving said second signals at said processor, and said processor being operable to determine said readings from said sensor devices based on said delay times; and wherein said diagnostic device is operable to determine said unit status of said unit based on said readings from said sensors and signals from said controller.

20. The system of claim 19, wherein said sensors include a return air temperature sensor, a mixed air temperature sensor and an outdoor air temperature sensor.

21. The system of claim 19, wherein said diagnostic device is operatively coupled to said controller to receive heating, cooling and control valve operation information from said controller.